

REMARKS/ARGUMENTS

Favorable reconsideration of this application as currently amended and in view of the following remarks is respectfully requested.

Claims 1-6 are currently active in this case. Claim 6 has been added by the current amendment.

Applicants acknowledge with appreciation the courtesy of an interview granted to Applicant's representative on March 14, 2006. During the interview, the outstanding Prior Art rejections were discussed. In view of the interview, Applicants have added new claim 6 which specifies that the insulated pipe is made of an insulting material. Regarding claim 5, Applicants submit for the reasons discussed during the interview that the 35 U.S.C. § 103 rejection should be withdrawn.

In the outstanding Office Action, Claims 1-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,869,883 to Mehringer et al. in view of U.S. Patent No. 5,172,213 to Zimmerman and U.S. patent No. 6,397,935 to Yamamoto et al.

Briefly recapitulating, the present invention (Claim 1) is directed to a semiconductor device including a conductive pipe; a power semiconductor element; and an external connecting terminal including a tip portion bonded onto a plane of the conductive pipe. A mold resin covers the whole surface of the power semiconductor element, the whole of the inner lead part of the external connecting terminal, and the outer surface of the conductive pipe. The conductive pipe serves both as a refrigerant path for cooling the power semiconductor element and as a conducting path for conducting the power semiconductor element and the external connecting terminal. See the specification at page 5 lines 6-11.

Claim 3 is directed to a semiconductor device including an insulative pipe which functions as a refrigerant path; a power semiconductor element; and an external connecting terminal. The external connecting terminal includes an inner lead part including a pad part

bonded onto the plane of the outer surface of the insulated pipe. Claim 6 depends from claim 3 and specifies that the insulative pipe is made of an insulating material.

The Official Action concedes that Mehringer et al. fail to disclose the mold resin feature and the conductive pipe feature of claim 1. Applicants agree. However, the Official Action asserts (a) that Yamamoto et al. discloses a semiconductive device including a semiconductor power device 71 and a “conductive pipe” 40 and (b) that it would have been obvious to one of ordinary skill in the art to replace the conductive heat sink 14 of Mehringer et al. with the pipe 40 disclosed by Yamamoto et al. Applicants respectfully traverse.

Applicants point out that reference numeral 40 in the Yamamoto et al. patent designates an aluminum tube for *pouring* operating liquid into a heat transferring path. Yamamoto et al. fails to teach or suggest that the pipe 40 is configured to have a power semiconductor element fixed onto a plane of its outer surface or to have an external connecting terminal including an interleave part having a tip portion bonded onto the plane of the conductive pipe. That is, there is no teaching or suggestion in Yamamoto et al. that the delivery pipe 40 would be a suitable replacement for the conductive heat sink 14 disclosed by Mehringer et al. Further, there is no teaching or suggestion by any of the applied art that the pipe 40 is suited to serve both as a refrigerant path for cooling the power semiconductor element and as a conducting path for conducting a power semiconductor element and the external connecting terminal.

Regarding Claim 3, the Official Action asserts on page 5 that Mehringer et al. disclose an insulative heat sink 14. In contrast thereto, Applicants respectfully point out that page 3 of the Official Action asserts that the heat sink 14 of Mehringer et al. is a conductive heat sink. Applicants submit that the heat sink 14 cannot both be conductive and insulative.

Further, the Official Action concedes on page 5 that Mehringer et al. do not disclose the insulative heat pipe feature defined by Claim 3. Applicants agree. However, the Official

Action further asserts that Yamamoto et al. disclose a conductive pipe 40 and an insulative pipe including a vertical section of a rectangular shape. Regarding the insulative pipe, the Official Action points to Figure 4C and Figure 5B of Yamamoto et al. Applicants respectfully traverse the assertion that Yamamoto et al. teaches the insulative heat pipe feature of the present invention. Applicants submit that Yamamoto et al. do not disclose an insulative pipe, but rather disclose a tube for pouring an operating liquid into a heat transferring path. Further, there is no motivation in Yamamoto et al. or the other applied art that would suggest replacing the heat sink 14 of Mehringer et al. with an insulative pipe. If the pipe of Mehringer et al. were formed of an insulative material as suggested by the Office Action, then the heat sink would not have its required temperature conductive properties and hence would not work for its intended purpose.

For the foregoing reasons, the combination of Mehringer et al., Zimmerman, and Yamamoto et al. is not believed to render obvious the subject matter defined by independent claims 1 or 3. Dependent claims 2, 4, and 6 are believed to be allowable for at least the same reasons that claims 1 and 3 are believed to be allowable.

Consequently, no further issues are believed to be outstanding in the present application and the application is believed to be in condition for allowance. An early and favorable action is therefore respectfully requested.

Respectfully submitted,

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